Savings/Measurement & Verification

Rebuild America

Massachusetts Division of Energy Resources

Performance Contracting Seminar

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Measurement & Verification (M&V)

- Measure, verify, quantify, and analyze
- Crucial to defining Customer's project risk
  - Risk determination
  - Risk mitigation
  - Risk allocation
- M&V is what will determine the actual savings – simply "guaranteeing" savings is not enough to protect the Customer

M&V Plan

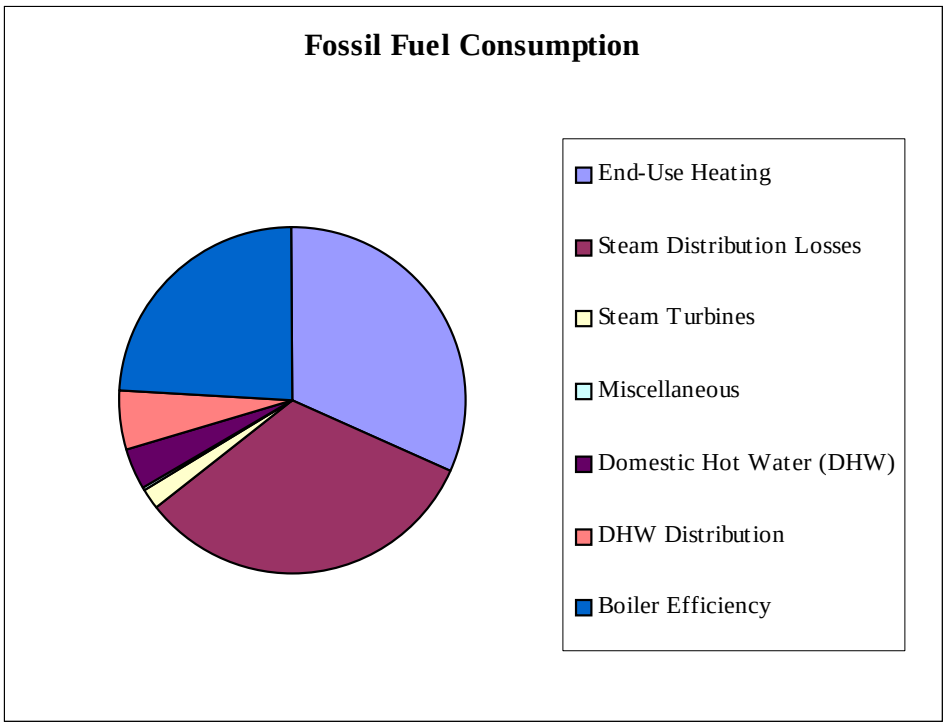
- Baseline Development Procedure
- Savings Calculations
- Specific plan to meet the needs and desires of Customer
- Adhere to International Performance Measurement & Verification Protocol (IPMVP)

Important Aspects of Baseline

- Constant load or variable load
  - Identify weather related impact on energy usage
- Account for interaction between Energy Conservation Measures
- Identify current operating parameters and their effect on energy usage
- Identify cost structure as it applies to energy savings
- Essentially quantify where the energy is currently going – allows accurate analysis for savings reductions

Baseline Development

End-Use analysis - apportion energy consumption for each use as a % of the total consumption. Identify where the energy is going.



	MMBTU	
End-Use Heating	55,816	32%
Steam Distribution Losses	57,167	33%
Steam Turbines	3,809	2%
Miscellaneous	382	0%
Domestic Hot Water (DHW)	6,994	4%
DHW Distribution	9,500	5%
Boiler Efficiency	42,774	24%
Totals	176,443	100%

Savings Calculations

- The algorithms used in the savings analysis should be the basis for the M&V algorithms
- Assumptions made as part of the savings analysis may be metered throughout the project term to ensure savings are being met
- Typically utilize Energy Management System as the basis of metering plan – this minimizes M&V cost

$$ECMSavings = Baseline - PostInstallation$$

$$Baseline = \sum \left(kW_{Base} \times {\$}/{kW} \times {mths}/{yr} + kW_{Base} \times Hrs_{Base} \times {\$}/{kWh} \right)$$

$$PostInstallation = \sum \left(kW_{retro} \times {\$}/{kW} \times {mths}/{yr} + kW_{retro} \times Hrs_{retro} \times {\$}/{kWh} \right)$$

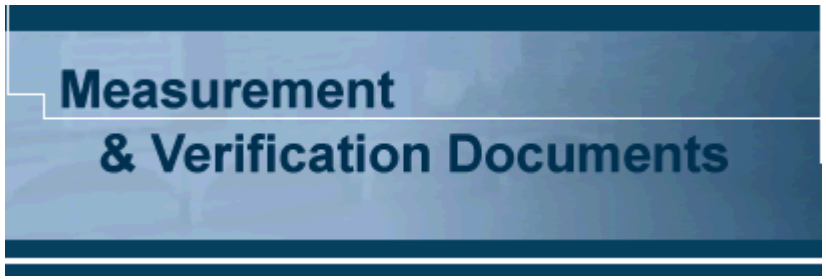
IPMVP

- Provides an overview of “best practice techniques” for verifying savings

- Provides guidance on general procedures to achieve reliable and cost-effective determination of savings

- Defines 4 “options” for measurement and verification

Publications and Manuals



ateam.lbl.gov/mv/

ipmvp.org

IPMVP – Option A

Partially Measured Retrofit Isolation

- Isolate individual system usage from rest of utility usage

- Engineering calculations using short-term or continuous post-retrofits measurements and stipulations

IPMVP – Option B

Retrofit Isolation

- Isolate individual system usage from rest of utility usage
- Engineering calculations using short term or continuous measurements
- No stipulations are allowed – full measurement is required

IPMVP – Option C

Whole Facility

- Savings are derived by measuring the total facility or sub-facility usage before and after implementation
- Intended for situations where savings are expected to be large enough to overcome potential variations in the facility meter
- Typically require significant adjustments

IPMVP – Option D

Calibrated Simulation

- Savings are determined through simulation of the energy use of individual systems, or even the entire facility
- Calibration to metered facility usage is crucial to this option
- Assumptions in the analysis must be verified

Typical M&V costs

Option A: 1% - 5% of project costs

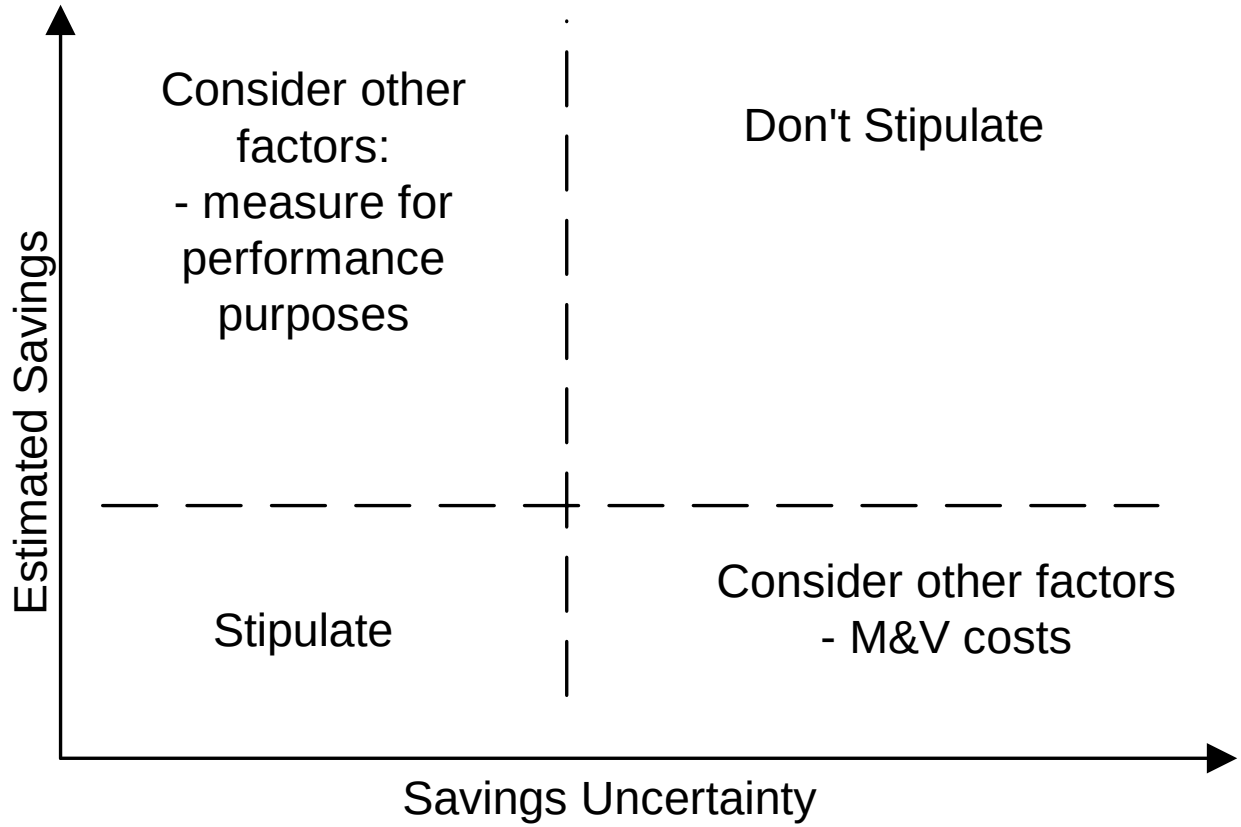
Option B: 3% - 15% of project costs

Option C: 1% - 10% of project costs

Option D: 3% - 15% of project costs

Source: Schiller and Associates June 12, 2001 presentation: "Measurement & Verification of Energy Savings"

How Much M&V is Enough?



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Summary

- Accurate baseline
- Delineated savings for each ECM
- Savings calculations
- Utility rates used
- Interaction between measures

Thank You

Questions & Answers

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